SOCIETIES AND ACADEMIES.

LONDON.

Royal Society, May 26.—"Contributions to the study of 'Flicker.'" By T. C. Porter (Eton College). Communicated by Lord Rayleigh, F.R.S.

The first part of the paper describes experiments made to ascertain the exact relative rotations at which the flicker of a disc, half black, half coloured, vanishes in the different colours of the spectra of sun- and lime-light, formed by a diffraction grating of 14,434 lines to the inch. The main precautions which must be taken are briefly stated, with a short discussion of the results, which may be summed up as follows.

The rate of rotation of the disc that the flicker may just vanish is highest for the yellow, decreasing for the succession of colours on either side of this one, being the same for the deepest visible crimson and full green; from the full green to the violet end of the spectrum the rate continues to fall off, till in the last visible rays it is very nearly one-half its maximum for the yellow.

When the intensity of the different spectra is varied, the greater the intensity the more rapid is the rate of rotation necessary for flicker just to vanish; thus, as the stimulus applied to the retina increases in intensity, the impression produced retains its maximum value for a shorter and shorter time. That a brighter illumination of the disc does produce a greater stimulus (*i.e.* that neither the contraction of the pupil, nor any other cause, overcomes the effect of brighter illumination) is proved by the fact that the brighter the light, the brighter on the whole is the disc, when flicker has just vanished. Research was made to discover in what way the rotation of a black and coloured disc must be varied for flicker to vanish, when the proportion of the coloured to the black sector varied by stages of 10° at a time, the experiments being carried out in each of the main colours of the lime-light spectrum.

Throughout this series of experiments the intensity of the illuminant was kept constant. The results are expressed in a series of rather remarkable curves, the rate of rotation rising rapidly with the instalments of 10° to the coloured sector, then remaining at its maximum, and constant within the errors of experiment, from a coloured sector of about 150° to one of about 240°, after which the rate of rotation falls off somewhat more rapidly than it rose when the coloured sector was small.

The remainder of the paper is devoted to the discussion of these curves, and it concludes by proving from a series of points, taken at random on one of them, that the duration of the impression on the retina undiminished is inversely proportional to the time during which the retina is stimulated. Some other conclusions of interest are arrived at; but for the reasoning and description of experiments necessary, we must refer to the paper itself: *e.g.* (1) When flicker has just vanished, the effective stimulus at any point of the retina is to the maximum stimulus the coloured sector can produce, as the angle of the yellow sector is to the angle of the whole disc (*i.e.* 360°), the illumination being supposed constant. (2) The coloured sector always requires a finite time in order to produce its maximum effect on the retina. (3) When the width of the white or coloured sector is increased in steps of 10° at a time, the increment in the apparent brightness in the rotating and flickerless disc follows, within the errors of experiment, the series of 1/0, 1/1, 1/2, 1/3, 1/4, &c., as it should. The paper is the first of a series on the subject.

"Aluminium as an Electrode in Cells for Direct and Alternate Currents." By Ernest Wilson. Communicated by Dr. J. Hopkinson, F.R.S.

This paper deals with the apparent great resistance which aluminium offers to the passage of an electric current when coated with a film and used as an anode in cells containing, for instance, such an electrolyte as alum in water.

Part i. deals with experiments made on aluminium-carbon cells with direct currents, the electrolytes used being alum solution, dilute sulphuric acid, and sodium hydrate in water.

After making a preliminary experiment in which an exploring electrode inserted between the plates was used to allocate the distribution of potential difference in the cell, the author describes a series of experiments made with a view to finding the effect of variation of current density and temperature upon the potential difference between the Al and C plates. Two cells were constructed and, during the forming process, which consisted of passing a current of ·005 ampere per square inch of the Al anode for forty-seven hours, one of them contained a dilute H_2SO_4, and the other a saturated potash alum solution. The apparent resistance was not nearly so marked in the H_2SO_4 solution cell as in the other.

The H_2SO_4 solution was then replaced by a saturated alum solution, and the two cells submitted to a further forming process for thirteen hours. The two cells were then experimented upon at approximately constant temperature, but the current density varied. The potential difference in the two cases rose from 1·89 to 34·5 volts as the current density varied from ·00006 to ·12 in the case of the H_2SO_4-formed plate, and from ·00011 to ·041 in the other. With about 39 volts directly applied to each the current rapidly increased in the two cells, accompanied by rapid increase of temperature from its final value of about 20° C.

The cell containing the alum-formed plate was next heated; the current density of the Al anode kept approximately constant at ·019 ampere per square inch, and the temperature raised from 13° to 70° C. The potential difference fell from 30 to 3 volts under these conditions.

The potential difference was not materially increased by cooling a cell in a freezing mixture of carbonic acid snow and ether.

One of these films was examined under a microscope and analysed by Mr. Herbert Jackson, of King's College, London, who states "that the skin over the plate is seen to be full of minute cracks, giving the impression of a dried gelatinous pellicle; not an unexpected appearance if the plate had been covered when wet with a thin coating of the gelatinous aluminium hydroxide. The analysis of the film over the metal shows it to consist of basic aluminium sulphate."

An experiment was made upon a film which was formed without the passage of current by first submerging a bright Al plate in alum solution, and then exposing it to the atmosphere. The author concludes that this film has the same effect as another formed during the passage of current.

Part ii. deals with alternate currents. Experimenting first with Al-C plates in potash alum solution, the frequency was varied from 16 to 98 periods per second, and the current density varied from ·0396 to ·583 ampere per square inch of the Al plate. The results show that small currents are accompanied by large phase difference; but the effect looked for, namely a large ratio between the maximum coulombs in the two halves of a period, has not time to properly develop at the frequencies tried.

The next set of experiments deals with a "rectifier" for alternate currents proposed by Graetz, in which Al-C cells are employed. It is shown that a uni-directional current can be produced by the Graetz arrangement, and the efficiency of such a system is discussed.

The concluding portion of these experiments deals with aluminium plates only for the purpose of forming the electrodes of a condenser for alternate currents. Soda, ammonia, and potash alums, both saturated and non-saturated, are employed as electrolytes. The frequency is varied from 7·5 to 100 periods per second, and the current density from ·0139 to ·6. The results show that phase differences of the order of 60° and 70° (360° = 1 period) can be obtained by a suitable choice of current density and temperature. Maximum phase difference develops with small currents at low temperature. With regard to frequency, both saturated and non-saturated solutions give a higher efficiency at the higher frequency. The conclusion is that the metal aluminium is suitable for use as the plates of condensers if due regard be given to current density and temperature.

Royal Microscopical Society, May 18.—Mr. E. M. Nelson, President, in the chair.—The President exhibited a simple form of student's microtome, suitable for cutting soft sections. It was made by Messrs. Reynolds and Branson, of Leeds, and was on the principle of the Williams microtome, but consisted only of a plate of glass and an adjustable casting carrying the razor. The chief point of interest was its low cost.—The President read three short papers which had been received from Mr. Jourdain. The first was on a new apochromatic objective constructed without the use of fluorite. This objective is made by the Bausch and Lomb Optical Company, who have promised to send examples to Mr. Jourdain for examination. The other papers by Mr. Jourdain were on a method of adjusting the sizes of coloured images yielded by the Cooke lens, and on the construction of the planar lens and its use in low power photomicrography.—The President read a note on the optics of photographic lenses.—A paper by Mr. F. W. Millett, which was a continuation of his "Report on the Foraminifera of the Malay Archipelago," being of a highly technical character, was taken as read.—There was a very interesting exhibition of microscopic aquatic life by members of the Quekett Microscopical Club and Fellows of the Society.

Anthropological Institute, May 24.—Mr. F. W. Rudler, President, in the chair.—Prof. E. B. Tylor, F.R.S., having exhibited lantern photographs of the great totem-post from Queen Charlotte's Island, sent over by Mr. Bertram Buxton, and now erected in the grounds of Fox Warren, near Weybridge, the residence of Mr. Charles Buxton, took this as the text for a critical examination of totemism in general, as regards both its real importance and the somewhat extreme ideas of its place in anthropology and theology, which have been gaining ground ever since J. F. McLennan brought it into notice in his "Primitive Marriage." This writer at first looked at it purely in its legal aspect, the group of clans named after animals—as Wolf, Bear, Tortoise, Snake, &c.—being used as a means of dividing tribes, so as to regulate their exogamy or marrying-out; a Wolf man, for instance, not being allowed to marry a Wolf, though he might marry a Bear. Later McLennan wrote papers on the worship of animals and plants in the *Fortnightly Review*, which he did not republish, but which have served to model public opinion since. As bringing the subject into scientific view, these papers were admirable; but they plunged into somewhat reckless theories which have held their own, notwithstanding incompatibility with evidence. Especially the word totemism, originally referring to exogamous human clans named from animals, was used in the large and complex sense of animal-worship, to only a fraction of which the totem-clans really belong. This discrepancy became serious when, for instance, in Fiji a god who embodied himself in serpents, was treated as if his worshippers formed a serpent-clan; in such a case the serpents being regarded as totems, and it being further supposed that the superior gods of the land were evolved out of such totem-animals. When this notion was later expanded in the works of Frazer and Jevons, it gradually produced a theory of totem-animals having been the origin from which a rude form of monotheism arose in the religion of mankind. As an instance how misleading such reasoning may be, it was pointed out that the great Heaven-god Tangalsa, whose veneration extends over the islands of the Pacific, is in Samoa incarnate in a species of snipes. According to this totemic theory of gods, the vast Sky-god would be a developed and exaggerated snipe. It was argued also that attempts to support Robertson Smith's doctrine of the Slain-god, with its further sacramental implications, by certain supposed piacular sacrifices of totem-animals to the totem-god, were not to be depended on, the few instances alleged being cases of animals put to death for reasons not necessarily sacrificial. As to the real meaning and origin of totemism, Prof. Tylor pointed out that modern information has thrown considerable light on the annuistic processes by which totems probably came into existence. The evidence of Wilken and Codrington, from the Malay and Melanesian region, shows the prevailing doctrine of transmigration of soul to convert an ordinary form of animal-worship into what hardly wants more than the name to become a totem. An influential native on his death-bed will announce to his family the animal into which his soul will migrate, perhaps a crocodile or shark by preference; taking him at his word, his kinsfolk will worship the creature—above all, not killing or eating it—and the crocodile or shark species becomes their protector. Such a family multiplying, and being called after sacred animals, will become crocodiles or sharks, clans whose totem is the crocodile or the shark.

Entomological Society, June 1.—Mr. R. Trimen, F.R.S., President, in the chair.—Mr. P. B. Mason exhibited a specimen of the rare *Lathridius filum* from his own herbarium. It had been previously taken at Edinburgh by McNab, and he understood that an example had been found in a sealed envelope containing *Marchantia* from Franz Josef Land.—Mr. J. J. Walker exhibited a singular blue variety of *Carabus monilis*, Fabr., resembling in colour *C. intricatus*, and taken at Iwade, Kent, in flood-rubbish in May.—Mr. F. Merrifield forwarded for exhibition from Riva on the Lago di Garda larvæ of the "Corsican form," var. *ichnusa*, of *Aglais urticæ*.—Mr. G. C. Champion called attention to Mr. A. Somerville's recently-published sheet of the county and vice-county divisions of the British Isles for biological purposes, and a discussion ensued thereon.—Papers were communicated by Sir G. F. Hampson, Bart., on "The Moths of the Lesser Antilles," and by Mr. J. H. Leech on "Lepidoptera Heterocera from Northern China, Japan, and Korea."

Chemical Society, June 2.—Prof. Dewar, President, in the chair.—The President announced the death of the Right Hon. Lord Playfair, the senior past President, and last surviving founder of the Society.—The following papers were read:—The boiling point and density of liquid hydrogen, by J. Dewar. Liquid hydrogen boils at about -238° C., and its density at the boiling point, determined by measuring the gas obtained by evaporating 10 c.c., is about 0·07. Since the hydrogen occluded by palladium has the density 0·62, it cannot be associated with the metal in the liquid state.—The action of hydrogen bromide in presence of ether on carbohydrates and certain organic acids, by H. J. H. Fenton and Mildred Gostling. The formation of ethylic dihydroxymaleate by the interaction of the acid with dry ether and hydrogen bromide is generally applicable to the preparation of alkylic salts. On applying the reaction to carbohydrates and polyhydric alcohols, it is found that an intense purple or red coloration is sometimes obtained with ether and hydrogen bromide; the coloured matter produced resembles the metafurfurol of Stenhouse and others.—Production of some chloropyridinecarboxylic acids, by J. N. Collie and W. Lean.

Linnean Society, June 2.—Mr. Albert D. Michael, Vice-President, in the chair.—The Chairman announced that the President had nominated Messrs. William Carruthers, Frank Crisp, Albert D. Michael, and Dr. D. H. Scott to be Vice-Presidents for the ensuing year.—Dr. St. George Mivart, F.R.S., contributed a paper entitled "Notes on Lories." Referring to a recently published paper by Captain Hutton on the value of specific characters (*Linn. Soc. Journ.*, *Zool.* xxvi. p. 330), in which the writer had stated the results of his examination of a large number of pigeons belonging to the genus *Ptilopus*, and his reasons for concluding therefrom "that the specific characters of these species could not have arisen as 'recognition marks' or from any other mechanical mode of origin," Dr. Mivart adduced other examples in support of this view from the family *Loriidæ*, or brush-tongued parrots. From the facts collected he expressed his conviction that the cause of specific characters still remained an unsolved enigma, the solution of which would probably not be achieved until the higher psychological problems of biology were more widely understood, and the light thus gained had been reflected on questions of ordinary physiology.—Mr. E. S. Salmon read a paper entitled "A Revision of the Genus *Symblepharis*." This genus of mosses, he said, as founded by Montagne in 1839, had proved too narrow, through the limits imposed by certain peristome characters, and he was of opinion that Mitten's later emended description should be accepted.—Surgeon-Captain Cummins read a paper on the food of the Uropoda. The nature of the food of these mites, which belong to a highly specialised genus of the *Gamasinæ*, had long been a puzzle even to those who have paid particular attention to their organisation. From careful experiments and observation, the author of the paper had come to the conclusion that amongst the organisms on which the Uropoda live were many species of bacilli, including the potato bacillus and the earth bacillus. Wild yeast-cells were rapidly devoured, as also were *Micrococci*. He had little doubt that they consumed the gonidia of Fungi, for species of *Penicillium* and *Mucor* never appeared in the boxes which contained mites in large numbers; otherwise they were commonly present. Mr. A. D. Michael, in criticising the paper, pointed out the distinguishing characters of the Uropoda as compared with others of the *Gamasinæ*, and especially the peculiar form of the mandibles, which suggested a different mode of feeding to that adopted by other mites.—Mr. C. B. Clarke, F.R.S., gave a summary of a paper on the subdivision of biological areas in India, and in the course of his remarks mentioned some interesting facts in connection with plant distribution in the Indo-Oriental region. Dr. Otto Stapf, in commenting on the paper, expressed the opinion that the limits of the subdivisions proposed were natural, and might well be accepted by botanists.

Geological Society, June 8.—W. Whitaker, F.R.S., President, in the chair.—On the discovery of natural gas in East Sussex, by C. Dawson. Inflammable natural gas was first recorded by Mr. H. Willett in his thirteenth quarterly report of the Subwealden Exploration. Another discovery was in a deep artesian boring in the stable-yard of the New Heathfield Hotel. In 1896, at a site about 100 yards distant from the last-mentioned locality, a boring was put down by the London, Brighton and South Coast Railway Co., the details of which are given in the paper, together with those of the earlier Heathfield boring. From this boring gas has been escaping for the last eighteen months, with a pressure of not less than 15 lb. to the square inch, and at the rate of about 12¼ cubic feet per hour (with a pressure of 20 tenths maintained), although the ube is stopped up, and is partially filled with water (see NATURE, ol. lii. p. 150). Though deficient in illuminating quality, the gas burns well when mixed with air, and gives a good bunsen-flame. The author considers that it is probably derived from the lower beds pierced, that is, the Purbeck strata, or by percolation from the still lower Kimeridge beds, which were not reached by the borings. The borings pierce the southern slope of the great anticline which runs from Fairlight into mid-Sussex, and is joined at Heathfield by another considerable anticline running through Burwash.—Note on natural gas at Heathfield Station (Sussex), by Dr. J. T. Hewitt. A sample of natural gas from the boring described above was taken in December 1897, and analysed with the following result: Methane, 91·9; hydrogen, 7·2; nitrogen, 0·9. Oxygen, carbon dioxide, carbon monoxide, olefines, and hydrocarbon vapours were altogether absent.—On some high-level gravels in Berkshire and Oxfordshire, by O. A. Shrubsole. The high-level gravels are divided by the author as follows, beginning with the oldest: (1) Pebble-gravel, composed very largely of flint or chert; (2) the Goring Gap gravel; (3) quartzose gravel, with only a small proportion of flint-pebbles; (4) quartzite-gravel, with purple and brown quartzite-pebbles; (5) local flint-gravels.—The *Globigerina*-marls of Barbados, by G. F. Franks and Prof. J. B. Harrison, with an appendix on the Foraminifera by F. Chapman. After a reference to previous publications on the island by one of the authors and Mr. Jukes-Browne, an account is given of the tectonic structure of Bissex Hill, on which the principal exposures of the *Globigerina*-marl occur. In the appendix a list of 146 species of foraminifera is given. Fifteen of these occur only in strata ranging from the Cretaceous to the Pliocene Period. The rocks bear some resemblance to the limestones and marls of Malta and to the *Globigerina*-beds of Trinidad; the recent foraminifera indicate that the deposit was formed at a depth of about 1000 fathoms and at some distance from land.

Zoological Society, June 7.—Dr. Albert Günther, F.R.S., Vice-President, in the chair.—Mr. L. A. Borradaile read the second part of a paper on Crustaceans from the South Pacific. In this part twenty-one species of *Macrura anomala*, examples of which had been collected in the islands of Rotuma and Funafuti by Mr. J. Stanley Gardiner, were enumerated, and notes were given on several of them. Under the head of *Petrolisthes lamarcki* the author proposed to unite a number of forms previously considered as specifically distinct.—A communication was read from Mr. A. E. Shipley containing an account of the gephyrea or unsegmented worms collected by Mr. J. Stanley Gardiner at Rotuma and Funafuti. These comprised examples of two species of Echiuroidea and twelve of Sipunculoidea. Of the latter group two new species were described, viz. *Sipunculus rotumahensis* and *S. funafuti*, and *Physcosoma varians* was recorded for the first time from the Pacific.—Mr. G. A. Boulenger, F.R.S., read a fourth report on the additions to the Batrachian Collection in the Natural History Museum, containing a list of the species of this class (115 in number), new or previously unrepresented, of which specimens had been added to the collection since November 1894. Eight new species were described in this paper.—Mr. G. A. Boulenger, on behalf of Count Peracca, gave an account of a new species of newt (*Molge italica*), recently discovered in Southern Italy, and exhibited some living specimens of it.—A communication was read from Mr. L. W. Wiglesworth, entitled "Theories of the Origin of Secondary Sexual Characters," which contained arguments in favour of the theory of the stimulation of parts to higher development through use or external violence or irritation, as observed in birds.—A communication was read from the Rev. O. Pickard Cambridge, F.R.S. It contained an account of a collection of Araneidea from Savoy, comprising examples of twenty-four species, one of which (*Gnaphosa molesta*) was described as new.

Mathematical Society, June 9.—Prof. E. B. Elliott, F.R.S., President, in the chair.—The President briefly noticed the loss sustained by the Society owing to the recent deaths of Mr. H. Perigal (elected January 23, 1868) and of the Rev. Dr. Percival Frost, F.R.S. (elected December 9, 1869) (see NATURE, No. 1493, p. 131).—The following communications were made: Point-groups in a plane, and their effect in determining algebraic curves, by Mr. F. S. Macaulay.—On a regular rectangular configuration of ten lines, by Prof. F. Morley.—On the conformal representation of a pentagon on a half-plane, by Miss M. E. Barwell.—On the general theory of anharmonics, by Prof. E. O. Lovett.—On the calculus of equivalent statements (eighth paper), by Mr. H. MacColl.—On a continuous group defined by any given group of finite order (second paper), by Prof. W. Burnside, F.R.S.—On certain regular polygons in modular network, by Prof. L. J. Rogers.

Royal Meteorological Society, June 15.—Mr. F. C. Bayard, President, in the chair.—A paper by Mr. R. C. Mossman was read on the frequency of non-instrumental meteorological phenomena in London with different winds from 1763-1897. In previous papers the author has discussed the secular and seasonal variation of various phenomena, and he now gives the results of an analysis of the direction of the surface winds observed during the occurrence of snow, hail, gales, thunderstorms, lightning, fog, and aurora. Snow is of most frequent occurrence with north and east winds, and least common with S.W. winds. Hail showers occur most often with W., N.W., and N. winds. Gales are most frequent with W. and S. winds. The greatest number of both summer and winter thunderstorms occurs with W. winds, although the values in summer are high with E., S.E., and S. winds. The greatest number of fogs are recorded on calm days, closely followed by days on which the wind blew from the east.—A paper, by Mr. A. L. Rotch, was also read on the exploration of the free air by means of kites at Blue Hill Observatory, Mass., U.S.A. After giving a brief account of the use of kites for scientific purposes from 1749 to the present time, the author describes the various forms of kites which have been employed at Blue Hill Observatory, viz. the Eddy, or Malay tailless kite; the Hargrave cellular or box kite; and the Lamson aero-curve kite. The highest flight was on October 15, 1897, when, by means of four kites having a combined lifting surface of 150 square feet, the meteorograph at the end of 20,100 feet of wire was raised vertically 11,080 feet above the hill. About 200 records from kites have been obtained in the free air at heights from 100 to 11,000 feet in all kinds of weather. Mr. Rotch maintains that the kite can be made of the greatest importance for meteorological investigation. At the recent meeting of the International Aeronautical Committee at Strassburg it was recommended that all central observatories should employ kites as being of prime importance for the advancement of meteorological knowledge.

Edinburgh.

Royal Society, June 6.—Lord McLaren in the chair.—Prof. C. G. Knott read a paper on magnetic strains, being a continuation of a paper already published in the *Transactions*. Iron, nickel, and cobalt tubes of various dimensions were studied in detail. As a rule each was the subject of four distinct experiments. The change of length in the magnetic field was first measured; then the change of volume of the material; thirdly, the change of volume of the bore; and finally the change of external volume of the tube when plugged up at both ends. From these the coefficients of strain of an element at both the internal and external surface were calculated. Many details of interest were touched upon, and the general conclusion arrived at that the system of stresses required to maintain the complicated state of strain indicated could not be accounted for in terms of any of the recognised theories connecting magnetism and stress.—Dr. A. T. Masterman read a paper on the further anatomy and the budding processes of *Cephalodiscus dodecalophus*. Among the chief features dealt with may be mentioned the following. The pharynx has special adaptations for the separation of food and water currents, *e.g.* hyper- and hypo-pharyngeal grooves, the peripharyngeal groove, the pharyngeal clefts, &c. The notochord of the *Chordata* may be primarily derived from this source as a channel for cloacal water. The pedicle or ventral sucker has a ventral nerve cord and two ventro-lateral cords, a dorsal and a ventral blood sinus and complete inner layer of longitudinal muscles. The buds arise usually in pairs ventrally. The pharyngeal clefts arise as endodermal diverticula, which break through the ectoderm to the exterior. The sexual development commences in the egg capsule whilst attached to the inner wall of the cœnœcium, and results in the form of a larva segmented into two parts by an annular constriction.—Mr. Malcolm Laurie gave a description of a new Silurian scorpion from the Pentland Hills, the fourth that had been found in Silurian rocks. Regarding certain structures on the abdominal segments, the hypothesis was advanced that the new form was a water-breathing animal. A description was also given of some new Eurypterids, of which no fewer than twelve species had been found in this particular Pentland bed.—Dr. Masterman also communicated a paper on the theory of archimeric segmentation, considered in relation to the classification of the *Cœlomata.* This was a following up of a suggestion made in a recent paper that in the morphology of the *Cœlomata* there are two distinct types of segmentation: (*a*) a primitive or archimeric type, having in its constitution evidences of a radial origin, and (*b*) a secondary or metameric segmentation superposed upon the former, and bearing evidence of a bilateral origin.

Mathematical Society, June 10.—Dr. Mackay in the chair.—The following papers were read:—Notes on permutations, &c., by Mr. R. F. Muirhead.—Extension of the method of displacement-sequence, by Mr. R. F. Muirhead.—Converse theory of binomial theorem, by Mr. Sita Noth Chokrobarthy.—Elementary notes, by Mr. W. J. Butters.

Dublin.

Royal Dublin Society, May 18.—Prof. D. J. Cunningham, F.R.S., in the chair.—Dr. F. T. Trouton, F.R.S., communicated a method of measuring the surface tension of liquids which depends on the rate at which a column of liquid fills, or empties itself out of a tube of fine bore. The tube is placed horizontally and has one end bent downwards into a vessel of the liquid. By altering the level of the liquid it can be either arranged to measure the rate the tube fills, in which case the capillary forces draw the liquid up, or the rate it empties, the capillary forces retarding Were the flow viscous the distance traversed would be proportional to the square root of the time. This was shown to be approximately true. Experiments were described using an inclined tube with a wide bent-down portion attached to the lower end. The rate of emptying could be made constant by making the height of the liquid in the wide part equal to the capillary elevation in the fine tube. Experiments were also described made with liquids such as soap solution, where surface tension varies with time.—The Rev. H. O'Toole exhibited and described a new hydrometer, which consists of a stem at the lower end of which is a weighted bulb, as in any of the common forms of hydrometer; higher up on the stem is another bulb, which causes the instrument to float, and at the top is a dish in which weights may be placed. Between the floating bulb and the dish there is another bulb, which may be called the standard bulb. The method of use is as follows: the apparatus is immersed in a given liquid, and weights added to make it sink to a marked point between the floating and standard bulbs; additional weights are then added to immerse the standard bulb to another marked point near the dish; these additional weights are evidently the weight of a volume of the liquid equal to the volume of the standard bulb. The weight of the same volume of water may be similarly found, and thus the specific gravity determined.—Prof. D. J. Cunningham, F.R.S., and Mr. Joseph Welland exhibited an apparatus for lantern-photography of microscopic objects. This is of interest as affording a means of using an ordinary optical lantern, with or without a microscopic projector, for making enlarged photographs of transparent microscopic objects, the precise degree of enlargement wished for being readily obtained. It has been employed chiefly for photographing large sections of the brain, and it is particularly well adapted for this purpose. Further, by means of this apparatus, transparencies reproducing the different colours of stained and injected tissues can be readily obtained by the Joly process. Slides showing a section through a kidney injected in two colours (red and blue) and a picrocarmine specimen of hair follicles were exhibited.—Mr. Richard J. Moss exhibited an apparatus for drying bodies *in vacuo* at various temperatures. Steam or other vapour is passed through a flat coil of pipe in an inverted bell-jar, closed with a glass plate and rubber ring, and attached to a water vacuum pump. A flat-bottomed platinum capsule containing the substances to be dried rests on the coil of pipe, and any desired desiccant is placed in a tray above it.

Paris.

Academy of Sciences, June 13.—M. Wolf in the chair.—Liquid air, by M. d'Arsonval. An account of the Linde process of liquefying air. An expenditure of rather less than three horse-power gives a litre of liquid air per hour.—Spectroscopic researches on atmospheric air, by MM. H. Moissan and H. Deslandres. A sealed note deposited May 11, 1896.—Remarks by M. H. Moissan on the above.—On the direct measurement of a quantity of electricity in electromagnetic units; application to the construction of a current meter, by M. R. Blondlot. A coil in the form of a ring is hung on a vertical axis inside a long horizontal bobbin, the same current passing round both coils. The product of the intensity of the current into the time of oscillation, that is, the quantity of electricity which traverses any given section of wire during one swing, is a constant quantity, depending only on the construction of the two bobbins. By the application of a device for counting the vibrations of the small coil, a practical coulombmeter is obtained, which works equally well with continuous and alternating currents.—On differential equations of the second order at fixed critical points, by M. Paul Painlevé.—On the problem of integration from the point of view of real variables, by M. R. Baire.—On mixtures of gases, by M. Daniel Berthelot. A discussion of Dalton's Law of mixed gases. Starting with the assumption that the law of Avogadro is only true in the limiting case of infinite volume, an expression is developed for the constants in the Van der Waal equation to the mixture. The results found experimentally by MM. Leduc and Sacerdote are in perfect agreement with the theory.—On the study of the radiations of mercury and the measurement of their wave-lengths, by MM. Ch. Fabry and A. Perot. A comparison of the green line and two yellow lines of mercury with the cadmium lines by means of the interferential spectroscope described in previous papers.—On the electrical resistance of steel, by M. H. Le Chatelier. The steels were examined in the form of well annealed bars, 20 cm. long and 1 sq. cm. in section. The resistance increases with increasing percentage of carbon, and similarly with silicon, 1 per cent. of the latter having double the effect of the same amount of carbon. Steels containing manganese, nickel, chromium, tungsten, and molybdenum were also examined.—Entoptic vision, and sensibility in the yellow spot, by M. Aug. Charpentier.—On the atomic weight of nitrogen, by M. M. Vèzes. From the densities of nitrogen and its compounds M. Daniel Berthelot has deduced an atomic weight of 14·005 for nitrogen, whilst the figure given by Stas is 14·044. This discrepancy cannot be accounted for, as MM. D. Berthelot and Leduc have assumed, by the systematic error introduced by oxygen dissolved in the silver, as M. Stas has himself carefully reconsidered the whole of his work in the light of this objection of Dumas, and has shown that the effect is practically negligible, the atomic weight in question being only lowered from 14·044 to 14·040. The cause of the difference still remains to be explained.—On the atomic weight of tellurium, by M. R. Metzner. The tellurium employed in this research was prepared by the decomposition of tellurium hydride at 500°; it is certain that this metal must be free from antimony and bismuth. The reactions chosen were the conversion of the metal into its sulphate, and the reduction of tellurous acid with carbon monoxide. The mean result is 127·9.—Action of sodammonium in excess upon red phosphorus, by M. C. Hugot.—On the preparation and properties of a new carbide of tungsten, by M. Percy Williams. The carbide is produced by the interaction of tungstic acid, carbon, and iron at the temperature of the electric furnace. Its formula is WC, and is distinguished from the carbide W_2C, discovered by M. Moissan, in not being attacked by chlorine.—New method of separating geraniol and citronnellol, by MM. J. Flatau and H. Labbé. The essence is converted into phthalic ethers by heating with benzene and phthalic anhydride, and these separated by means of ligroin. The ethers are described in detail.—On the composition of fish, crustacea, and molluscs, by M. Ballard. Determinations of water, nitrogen, fat, extractives, and ash for a large number of fish, crustacea, and molluscs.—On the crystalline forms of quartz from Meylan, by M. Ferdinand Gonnard.—On the direct fertilisation in some plants in which the flowers would appear to be adapted to cross fertilisation, by M. C. Gerber.—On a remarkable fault between Brives, Périgueux and Angoulême, by M. Ph. Glangeaud.—On new sources of petroleum in the Caucasus, by M. Venukoff. Naphtha-bearing sand has been found near Anaclie, in the Eastern Caucasus.—

Atmospheric situation at the time of ascent of experimental balloons, by M. H. Tarry.—The registration of atmospheric electric discharges, by M. Ducretet. The registration was effected by the Hertzian waves set up; the recording instrument was a Branly radio-conductor.—International balloon ascent of June 8, by M. W. de Fonvielle. The ascents were made on the same day at Paris, Brussels, Strassburg, Vienna, Berlin, St. Petersburg, and Munich.—Short account of the results of the ascents of three captive balloons at Trappes, by M. L. Teisserenc de Bort.

New South Wales.

Linnean Society, April 27.—Mr. P. N. Trebeck in the chair.—Some new genera and species of fishes, by J. Douglas Ogilby.—On the affinities and habits of *Thylacoleo*, by Dr. R. Broom. The author reopens a much-debated question in the light afforded by the interesting little fossil marsupial recently described by him under the name *Burramys parvus* [P.L.S.N.S.W., 1895, p. 563]. This little form, which is evidently the representative of a sub-family of the *Phalangeridæ*, in most of its characters agrees with the phalangers, but it possesses the greatly enlarged and grooved premolars of the rat-kangaroos; and not only does it show evidence of a group which fills the only remaining gap between the kangaroos and the phalangers, but as a phalanger with the posterior premolars enormously enlarged, it comes nearer to *Thylacoleo* than does any extinct or living form hitherto discovered. The conclusions arrived at are—That *Thylacoleo* is descended from a phalangeroid form not very dissimilar from *Burramys*, and that it was almost certainly a purely carnivorous animal.—Descriptions of new Australian lepidoptera: with a note on the occurrence of *Deilephila livornica*, Esp., at Broken Hill, N.S.W., by Oswald Lower. The beautiful sphingid, *Deilephila livornica*, Esp., was noticed by the author to be common during the early part of March last, at the electric lights at Broken Hill. On one occasion individuals were literally swarming. The species occurs in Europe, Africa, and S. Asia. It was first recorded from Australia by Mr. Miskin from a Queensland specimen. It is also known from Adelaide, but has not yet been reported from Victoria, Tasmania, or West Australia; nor has it been recorded previously from New South Wales.—Descriptions of a new Australian grass, by Fred. Turner. The species of *Panicum* described is a capital forage plant from the Liverpool Plains, N.S.W., its nearest allies being *P. semitonsum*, F.v.M., and *P. antidotale*, Retz, from North Australia.—Mr. Hedley exhibited a specimen of fully developed *Gundlachia* recently taken by Mr. H. Leighton Kesteven from a pool in the Botanical Gardens, Sydney. This is the second instance of its occurrence in Australia, and the first in New South Wales. The genus has been treated of at some length in vol. viii. (2nd series) of the Society's *Proceedings*. Possibly no real *Ancylus* exists in Australia, and all those hitherto reported will ultimately be shown to assume occasionally and at rare intervals the Gundlachia form.—Mr. Ogilby exhibited the type of the new bathybial fish from Lord Howe Island, described in his paper as *Æthoprora perspicillata*, and remarked that it may be distinguished from the three Atlantic species by the presence of a pair of supernumerary photophores between the upper angle of the eye and the ante-orbital.

DIARY OF SOCIETIES.

FRIDAY, June 24.

Physical Society, at 5.—Exhibition of an Apparatus illustrating the Action of Two Coupled Electric Motors: Prof. Carus-Wilson.—Exhibition of Weedon's Expansion of Solids Apparatus: J. Quick.—On the Theory of the Hall Effect in a Binary Electrolyte: Dr. F. G. Donnan.

SATURDAY, June 25.

Geologists' Association (Liverpool Street Station, G.E.R.), at 9.30 a.m. —Excursion to Sudbury. Director: Dr. J. W. Gregory.

MONDAY, June 27.

Royal Geographical Society, at 4.30.—Plans for the Construction and Erection of a Terrestrial Globe on the Scale of 1 : 500,000: Prof. Elisée Reclus.

THURSDAY, June 30.

Linnean Society, at 8.—A Revision of the Genus *Elæocarpus*, Linn.; Sir D. Brandis, K.C.I.E., F.R.S.—Observations on the *Membraniporidæ*, a Family of Marine Bryozoa: A. W. Waters.—On the Fruit of *Chnoospora fastigiata*, J. Agardh: Ethel S. Barton.

BOOKS, PAMPHLETS, and SERIALS RECEIVED.

Books.—Essai Synthétique sur la Formation du Système Solaire: G. Lafouge, Part 1 (Paris, Gauthier-Villars).—Calculations in Hydraulic Engineering: Prof. T. C. Fidler, Part 1 (Longmans).—South American Sketches: R. Crawford (Longmans).—Twenty-first Annual Report of the Connecticut Agricultural Experiment Station, for 1897 (New Haven).—Catalogue of Earthquakes on the Pacific Coast, 1769 to 1897: Dr. E. S. Holden (Washington).—Report of the U.S. National Museum for the Year ending June 30, 1895 (Washington).—Leçons Elémentaires d'Acoustique et d'Optique: Prof. C. Fabry (Paris, Gauthier-Villars).—A Manual of Bacteriology: Dr. R. T. Hewlett (Churchill).—Lectures on the Geometry of Position: Prof. T. Reye, translated and edited by Prof. T. F. Holgate. Part 1 (Macmillan).—The First Philosophers of Greece: A. Fairbanks (K. Paul).—The Study of Man: A. C. Haddon (Bliss).—Year-Book of the U.S. Department of Agriculture, 1897 (Washington)—Cape Photographic Durchmusterung for the Equinox 1875: Drs. Gill and Kapteyn, Part 2 (Darling).—Text-Book of Zoology: H. G. Wells and A. M. Davies (Clive).

Pamphlets.—Contribution iii. to the Coastal and Plain Flora of Yucatan: Dr. C. F. Millspaugh (Chicago).—Medical Missions in their Relation to Oxford: Sir H. W. Acland (Frowde).—Advanced Exam. Papers in Book-Keeping, with Notes by J. Thornton (Macmillan).—Boron Food Preservatives, &c. (Perkins).

Serials.—Journal of the Franklin Institute, June (Philadelphia).—Proceedings of the American Philosophical Society, December 1897 (Philadelphia).—Proceedings of the Academy of Natural Sciences of Philadelphia, 1897, October–December (Philadelphia).—Transactions of the Wagner Free Institute of Science of Philadelphia, Vol. v., January (Philadelphia)—Annals of the Astronomical Observatory of Harvard College, Vol. xlii. Part 1 (Cambridge, Mass.).—Académie des Sciences de l'Empereur François Joseph I. Bulletin International (Sciences Mathématiques et Naturelles et Médecine) (Prague).—Memorie della Societa Geografica Italiana, Vol. vii. Parte Seconda (Roma).—An Account of the Crustacea of Norway: G. O. Sars, Vol. 2, Parts 9, 10 (Bergen).—Archives of the Röntgen Ray, May (Rebman).—American Naturalist, April (Ginn). Morphologisches Jahrbuch, 26 Band, 1 Heft (Leipzig).—Botanische Jahrbücher, Sechsr. Band, 1 Heft (Leipzig).—Journal of the Scottish Meteorological Society, third series, Nos. 13 and 14 (Blackwood).—Zoologist, June (West).—Jahrbuch der K.K. Geologischen Reichsanstalt, Jahrg. 1897, xlvii. Band, 2 Heft (Wien).—Die Gastropoden der Trias um Hallstatt: E. Koken (Wien).—Psychological Review Monographs, Vol. ii. No. 4 Macmillan).

CONTENTS.

PAGE

Theoretical Mechanics. By **Prof. A. G. Greenhill, F.R.S.** . . . 169
London Birds. By **R. L.** . . . 172
Optical Activity. By **T. E.** . . . 172

Our Book Shelf:—

Beard: "The Span of Gestation and the Cause of Birth."—**Dr. Arthur Robinson** . . . 173
Todd: "A New Astronomy" . . . 173
Lush: "Lessons in Domestic Science" . . . 173

Letters to the Editor:—

Liquid Hydrogen.—**Dr. W. Hampson** . . . 174
Dendritic Patterns caused by Evaporation. (*Illustrated.*)—**Prof. G. H. Bryan, F.R.S.** . . . 174
Iridescent Surf at Cromer.—**Constance F. Gordon Cumming** . . . 174
Aquatic Hymenopteron.—**Fred Enock** . . . 175
"A High Rainbow."—**Prof. F. J. Allen** . . . 175
The Etiology and Prevention of Malarial Fever. By **Dr. E. Klein, F.R.S.** . . . 175
The University of London Commission Bill . . . 176
The Science and Art Buildings at South Kensington 176
Notes . . . 177

Our Astronomical Column:—

Comets now Visible . . . 181
The 40-inch Yerkes Refractor . . . 181
Variable Stars of Short Period . . . 181
The Oxford University Observatory . . . 182
The Supposed Variable Y Aquilæ . . . 182
Companions of Argon. By **Prof. William Ramsay, F.R.S.**, and **Morris W. Travers** . . . 182
On the Stability of the Solar System. By **M. H. Poincaré** . . . 183
On the Use of Methylene Blue as a Means of Investigating Respiration in Plants. By **Prof. J. B. Farmer** . . . 185
University and Educational Intelligence . . . 186
Scientific Serials . . . 187
Societies and Academies . . . 188
Diary of Societies . . . 192
Books, Pamphlets, and Serials Received . . . 192